

PATENT COOPERATION TREATY

PCT

REC'D 15 NOV 2005

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

PCT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2031427PC/nu	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/FI2004/000652	International filing date (day/month/year) 04.11.2004	Priority date (day/month/year) 06.11.2003
International Patent Classification (IPC) or national classification and IPC C08J 5/18, B29C 55/00		
Applicant VALTION TEKNIILLINEN TUTKIMUSKESKUS et al		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
 - ☒ (sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input checked="" type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |

Date of submission of the demand 19.08.2005	Date of completion of this report 08.11.2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Barbro Nilsson/Els Telephone No. +46 8 782 25 00

Form PCT/IPEA/409 (cover sheet) (April 2005)

BEST AVAILABLE COPY

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2004/000652

Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____,
which is the language of a translation furnished for the purposes of:
☐ international search (Rules 12.3(a) and 23.1(b))
☐ publication of the international application (Rule 12.4(a))
☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

- ☐ the international application as originally filed/furnished
☒ the description:
pages 1 - 12 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____
☒ the claims:
pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 13 - 15 received by this Authority on 19.08.2005
pages* _____ received by this Authority on _____
☒ the drawings:
pages 1 - 4 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____
☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing (*specify*): _____
☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing (*specify*): _____
☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2004/000652

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-23</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-23</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-23</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

This report is based on the amended claims filed on 19 August 2005

The invention concerns a method for producing an electrically charged, porous plastic film and the electrically charged, porous plastic film. It provides a method of generating fine-structured pore structure in plastic films with improved electromechanical response and sensitivity in electromechanical application and high thermal stability. Furthermore, it provides a solution to the problem that only a few plastic materials are suitable for use as a production material for films and that the electromechanical constant (d_{33}) of known porous electromechanical films decreases significantly and permanently when the temperature rises for a sufficiently long time, which restricts the use of the material to 50-60 °C depending on the application.

The problem is solved by using POS(S) Polyhedral Oligomeric Silsesquioxane or Polyhedral Oligomeric Silicate chemicals as an additive.

Cited documents:

D1: WO 0119596 A1
D2: WO 0172885 A1
D3: WO 0076634 A1

Document D1 describes a method and an apparatus for making a plastic film and a plastic film produced according to the method. Cavitation agent is mixed into the plastic material. The cavitation agent makes cavities in the plastic material when the plastic film is stretched. The cavities are further expanded by gas. D1 discloses that the filling material can

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: BOX V

be, for example, calcium carbonate.

D2 describes a method for incorporating POS(S) into a polymer, thereby improving, among other things, the thermal properties and the porosity of the polymer.

Furthermore, it is known per se in the art to use POS(S) as an additive to produce porous materials, see D3. D3 describes porous polymer films for the separation of gases.

There is no teaching in D2 or D3 to use POS(S) chemicals as cavitation agents in electromechanical films. The positive effects of POS(S) on electromechanical porous films are not disclosed by the cited documents. No relevant combination of the cited documents would lead a person skilled in the art to the claimed invention.

Therefore, the invention defined in claims 1-23 is novel and considered to involve an inventive step. The invention is industrially applicable.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2004/000652

Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

<u>Application No. Patent No.</u>	<u>Publication date (day/month/year)</u>	<u>Filing date (day/month/year)</u>	<u>Priority date (valid claim) (day/month/year)</u>
DE 103 04 735 A1	08/07/2004	06/02/2003	18/12/2002 20/12/2002
US 2004/0062888 A1	01/04/2004	03/02/2003	

2. Non-written disclosures (Rule 70.9)

<u>Kind of non-written disclosure</u>	<u>Date of non-written disclosure (day/month/year)</u>	<u>Date of written disclosure referring to non-written disclosure (day/month/year)</u>
---------------------------------------	--	--

AMENDED CLAIMS

1. A method of producing a porous plastic film, the method comprising:

producing a stretchable preform from a raw material blend comprising a polymer-containing basic material and an additive,

stretching the blank so as to form a film comprising pores, charging the porous film by directing an electric field over it, **characterized** by the additive comprising a POS(S) chemical.

2. A method as claimed in claim 1, **characterized** by stretching the preform biaxially.

3. A method as claimed in claim 1 or 2, **characterized** by stretching the preform within a draw ratio range of 2:1 to 8:1.

4. A method as claimed in any one of the preceding claims, **characterized** by the POS(S) being in a solid state at room temperature.

5. A method as claimed in claim 4, **characterized** by blending the POS(S) with the basic material at a temperature lower than the melting temperature of the POS(S).

6. A method as claimed in claim 4, **characterized** by blending the POS(S) with the basic material at a temperature exceeding the melting temperature of the POS(S).

7. A method as claimed in any one of the preceding claims, **characterized** by the POS(S) being in a liquid state at room temperature.

8. A method as claimed in any one of the preceding claims, **characterized** by the POS(S) comprising one or more of the following chemicals: dodecaphenyl-POSS $C_{17}H_{60}O_{18}Si_{12}$, isooctyl-POSS $[Me_3CCH_2CH(Me)CH_2]_nT_n$, wherein $n = 8, 10$ or 12 , octacyclohexyl-POSS $C_{48}H_{88}O_{12}Si_8$, octacyclopentyl-POSS $C_{40}H_{72}O_{12}Si_8$, octaisobutyl-POSS $C_{32}H_{72}O_{12}Si_8$, octamethyl-POSS $C_8H_{24}O_{12}Si_8$, octaphenyl-POSS $C_{48}H_{40}O_{12}Si_8$, octa-TMA-POSS $C_{32}H_{96}O_{20}Si_8 \sim 60$ H_2O , dodecatrifluoropropyl-POSS $C_{36}H_{48}F_{36}O_{18}Si_{12}$, octatrimethylsiloxy-POSS $C_{24}H_{72}O_{20}Si_{16}$, phenetyl-POSS $(PhCH_2CH_2)_nT_n$, wherein $n = 8, 10$ or 12 , phenetylisobutyl-POSS $C_{36}H_{72}O_{12}Si_8$.

9. A method as claimed in any one of the preceding claims, **characterized** by the basic material comprising one or more of the fol-

lowing polymers: polypropylenes, cyclic olefin copolymers, cyclic olefin polymers, polymethylpentene, polyethylene terephthalate, polybutene terephthalate, polyethylene naphthalate, polyeterimide.

10. A method as claimed in any one of the preceding claims, **characterized** by the thickness of the porous plastic film being 5 to 200 μm .

11. A method as claimed in any one of the preceding claims, **characterized** by the amount of POS(S) being 0.1 to 50 percent by weight calculated from the weight of the basic material.

12. A method as claimed in any one of the preceding claims, **characterized** by expanding the pores comprised by the film with gas.

13. A method as claimed in any one of the preceding claims, **characterized** by preparing an electrically conductive element on at least one side of the porous film.

14. A porous plastic film produced from a raw material blend containing a basic material and an additive mixed therewith, a plurality of pores being arranged in the structure of the plastic film, the pores being produced by stretching a preform made from the raw material blend and the plastic film being electrically charged, **characterized** in that the additive comprises a POS(S) chemical.

15. A plastic film as claimed in claim 14, **characterized** in that the pores are produced by stretching the preform biaxially.

16. A plastic film as claimed in claim 14 or 15, **characterized** in that the draw ratio of the stretching is within a draw ratio range of 2:1 to 8:1.

17. A plastic film as claimed in any one of claims 14 to 16, **characterized** in that the pores are closed pores.

18. A plastic film as claimed in any one of claims 14 to 17, **characterized** in that the POS(S) comprises one or more of the following chemicals: dodecaphenyl-POSS $\text{C}_{17}\text{H}_{60}\text{O}_{18}\text{Si}_{12}$, isooctyl-POSS $[\text{Me}_3\text{CCH}_2\text{CH}(\text{Me})\text{CH}_2]_n\text{T}_n$, wherein $n = 8, 10$ or 12 , octacyclohexyl-POSS $\text{C}_{48}\text{H}_{88}\text{O}_{12}\text{Si}_8$, octacyclopentyl-POSS $\text{C}_{40}\text{H}_{72}\text{O}_{12}\text{Si}_8$, octaisobutyl-POSS $\text{C}_{32}\text{H}_{72}\text{O}_{12}\text{Si}_8$, octamethyl-POSS $\text{C}_8\text{H}_{24}\text{O}_{12}\text{Si}_8$, octaphenyl-POSS $\text{C}_{48}\text{H}_{40}\text{O}_{12}\text{Si}_8$, octa-TMA-POSS $\text{C}_{32}\text{H}_{96}\text{O}_{20}\text{Si}_8 \sim 60 \text{ H}_2\text{O}$, dodecatrifluoropropyl-POSS $\text{C}_{36}\text{H}_{48}\text{F}_{36}\text{O}_{18}\text{Si}_{12}$, octatrimethylsiloxy-POSS $\text{C}_{24}\text{H}_{72}\text{O}_{20}\text{Si}_{16}$, phenetyl-POSS $(\text{PhCH}_2\text{CH}_2)_n\text{T}_n$, wherein $n = 8, 10$ or 12 , phenetylisobutyl-POSS $\text{C}_{36}\text{H}_{72}\text{O}_{12}\text{Si}_8$.

19. A plastic film as claimed in any one of claims 14 to 18, **characterized**

a c t e r i z e d in that the basic material comprises one or more of the following polymers: polypropylenes, cyclic olefin copolymers, cyclic olefin polymers, polymethylpentene, polyethylene terephthalate, polybutene terephthalate, polyethylene naphthalate, polyeterimide.

20. A plastic film as claimed in any one of claims 14 to 19, **c h a r - a c t e r i z e d** in that at least one of its surfaces is at least partly coated with an electrically conductive coating.

21. A plastic film as claimed in claim 14, **c h a r a c t e r i z e d** in that it is an electromechanical film and/or an electret film.

22. A plastic film as claimed in claim 21, **c h a r a c t e r i z e d** in that a change in electromechanical energy is arranged to take place through a change in the thickness of the film.

23. A plastic film as claimed in claim 21, **c h a r a c t e r i z e d** in that a change in electromechanical energy is based on variation of the location of the film in an electric field.